NASA TECH BRIEF

SPAN — Terminal Sterilization Process Analysis Program

The problem:

To achieve the appropriate probability of sterility required by the planetary quarantine constraints, a dry heat thermal sterilization process may be applied to a planetary capsule prior to launch. To minimize the severity of the sterilization cycle and also assure that the desired level of sterility is attained, it is necessary to account for the reductions in microbial population that occur during the transient phases of heating and cooling as well as the reductions that occur during the steady state phase.

The solution:

A computer program, based on the logarithmic survival of micro-organisms, computes a measure of the sterilizing process, which, when equal to unity is indicative that sterility has been achieved. The program then calculates the time necessary for heat application, the additional time required at steady state conditions, and the time necessary for cooling.

How it's done:

The basic required inputs are: (1) a thermal analysis of the capsule, (2) the probability of survival that must be achieved at the end of the cycle, (3) the microbial heat resistance characteristics, and (4) the number of micro-organisms present at the time of capsule sterilization.

The program has considerable flexibility in the values the basic inputs can assume. The temperature profiles from the thermal analysis must be input on tape. The tape input is the output (rows and columns rearranged by a simple subroutine to meet the format requirements of SPAN input) of a thermal analysis program (see note 2). A maximum number of 250 profiles can be accommodated, including up to 2000 time points on each profile. Each profile can have a different value for the probability of survival, the microbial heat resistance characteristics, and the number of micro-organisms; or, if desired, a fixed value for a given run for any of these parameters can be assigned. Other parameters which can be varied include the temperature at which microbial reduction begins, reference temperature, and tolerances. Also available are several tape search options and an alternate microbial reduction computation technique.

SPAN is primarily used in conjunction with a thermal analysis program for performing sterilization process calculations and sensitivity studies prior to sterilization of the capsule.

Notes:

1. This program is written in FORTRAN IV for use on the IBM 7094 computer.
2. NASA-developed thermal analysis programs, the output of which may be used, with format modification, as input to SPAN include:
   a. CINDA -*Chrysler Improved Numerical Analyzer* (available from COSMIC under program number MFS-2298)
   b. *Thermal Analyzer Computer Program for the Solution of General Heat Transfer Problems* (LR 18902) prepared by Lockheed-California Co. under NASA contract NAS 9-3349.
3. An identical program, SPAN C, which accepts temperature profiles from cards rather than tape, is available from COSMIC under program number NPO-10805.

4. Inquiries concerning this program should be directed'to:

      COSMIC
      Computer Center
      University of Georgia
      Athens, Georgia 30601
      Reference: B69-10104

Patent status:

No patent action is contemplated by NASA.

Source: Jet Propulsion Laboratory
(NPO-10804)